

CLAIMS

What is claimed is:

20-615
1. A method for a Max Sessions Server (MSS) of a data communications network keeping a count of the sessions used at a given time by a group of users to correct said count to compensate for abnormal disconnections of users belonging to said group, said method comprising:

10 assigning unique identification values (UIVs) to each user logged in at a port of a network access server (NAS);

maintaining a master list of UIVs associated with logged in users and their respective group identification information;

15 responding to a new user's attempt to log in to the data communications network by checking to see if the UIV of the new user is already in the master list, and if it is, clearing the entry in the master list and entering the new user's UIV and group identification information in the master list.

2. A method in accordance with claim 1, said responding further comprising:
20 decrementing a counter associated with a group associated with the UIV of the cleared entry; and

incrementing a counter associated with a group associated with the UIV of the new user.

3. A method in accordance with claim 1, further comprising:
rejecting the new user's attempt to log in to the data communications
network if the log in would cause a counter associated with a group to which the
new user belongs to exceed a predetermined number of maximum sessions.

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4. A method in accordance with claim 2, further comprising:
rejecting the new user's attempt to log in to the data communications
network if the log in would cause a counter associated with a group to which the
new user belongs to exceed a predetermined number of maximum sessions.

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5. A method in accordance with claim 1, further comprising:
allowing the new user's attempt to log into the data communications
network if the log in would not cause a counter associated with a group to which
the new user belongs to exceed a predetermined number of maximum sessions.

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6. A method in accordance with claim 2, further comprising:
allowing the new user's attempt to log into the data communications
network if the log in would not cause a counter associated with a group to which
the new user belongs to exceed a predetermined number of maximum sessions.

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7. A method in accordance with claim 1, wherein said assigning includes:
forming said UIV from a port identification associated with the port and
from a NAS identification associated with the NAS.

5 8. A method in accordance with claim 2, wherein said assigning includes:
forming said UIV from a port identification associated with the port and
from a NAS identification associated with the NAS.

10 9. A method in accordance with claim 3, wherein said assigning includes:
forming said UIV from a port identification associated with the port and
from a NAS identification associated with the NAS.

15 10. A method in accordance with claim 4, wherein said assigning includes:
forming said UIV from a port identification associated with the port and
from a NAS identification associated with the NAS.

20 11. A method in accordance with claim 5, wherein said assigning includes:
forming said UIV from a port identification associated with the port and
from a NAS identification associated with the NAS.

12. A method in accordance with claim 6, wherein said assigning includes:
forming said UIV from a port identification associated with the port and
from a NAS identification associated with the NAS.

5 13. A method for a Resource Control Server (RCS) of a data communications
network keeping a count of a particular resource used at a given time by a group of
users to correct said count to compensate for abnormal disconnections of users
belonging to said group, said method comprising:

10 assigning unique identification values (UIVs) to each user logged in at a
port of a network access server (NAS);

maintaining a master list of UIVs associated with logged in users and their
respective group identification information;

15 responding to a new user's attempt to log in to the data communications
network by checking to see if the UIV of the new user is already in the master list,
and if it is, clearing the entry in the master list and entering the new user's UIV and
group identification information in the master list.

14. A method in accordance with claim 13, said responding further comprising:
decrementing a counter associated with a group associated with the UIV of
20 the cleared entry; and
incrementing a counter associated with a group associated with the UIV of
the new user.

15. A method in accordance with claim 13, wherein said assigning includes:
forming said UIV from a port identification associated with the port and
from a NAS identification associated with the NAS.

5 16. A method in accordance with claim 14, wherein said assigning includes:
forming said UIV from a port identification associated with the port and
from a NAS identification associated with the NAS.

17. A program storage device readable by a machine, tangibly embodying a
10 program of instructions executable by the machine to perform a method for a Max
Sessions Server (MSS) of a data communications network keeping a count of the
sessions used at a given time by a group of users to correct said count to
compensate for abnormal disconnections of users belonging to said group, said
method comprising:
15 assigning unique identification values (UIVs) to each user logged in at a
port of a network access server (NAS);
maintaining a master list of UIVs associated with logged in users and their
respective group identification information;
responding to a new user's attempt to log in to the data communications
20 network by checking to see if the UIV of the new user is already in the master list,
and if it is, clearing the entry in the master list and entering the new user's UIV and
group identification information in the master list.

18. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for a Resource Control Server (RCS) of a data communications network keeping a count of a particular resource used at a given time by a group of users to correct
 5 said count to compensate for abnormal disconnections of users belonging to said group, said method comprising:
- assigning unique identification values (UIVs) to each user logged in at a port of a network access server (NAS);
 - maintaining a master list of UIVs associated with logged in users and their
 10 respective group identification information;
 - responding to a new user's attempt to log in to the data communications network by checking to see if the UIV of the new user is already in the master list, and if it is, clearing the entry in the master list and entering the new user's UIV and group identification information in the master list.
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19. A method for a Max Sessions Server (MSS) of a data communications network keeping a count of the sessions used at a given time by a group of users to correct said count to compensate for abnormal disconnections of users belonging to said group, said method comprising:
- 20 assigning unique identifications values (UIVs) to each used logged in at a port of a network access server (NAS);

maintaining a master list of UIVs associated with logged in users and their respective group identification information;

periodically checking a NAS to determine if it has become non-operational;

responding to the non-operational status of a NAS by removing all UIVs
 5 associated with the non-operational NAS from said master list and decrementing
 the count of the sessions used by the number of UIVs removed from said master
 list.

20. A method in accordance with claim 19 wherein said periodically checking
 10 is performed by an Authentication, Authorization and Accounting Server (AAA)
 associated with the MSS.

21. A method in accordance with claim 19, further comprising:
 transmitting a communication to another MSS on the data communications
 15 network to inform it of the non-operational status of a NAS.

22. A method in accordance with claim 21, further comprising:
 receiving a communication from another MSS on the data communication
 network advising of the non-operational status of a NAS;
 20 responding to said communication by removing all UIVs associated with
 the non-operational NAS from said master list and decrementing the count of the
 sessions used by the number of UIVs removed from said master list.

23. A method for a Resource Control Server (RCS) of a data communications network keeping a count of a particular resource used at a given time by a group of users to correct said count to compensate for abnormal disconnections of users belong to said group, said method comprising:

5 assigning unique identifications values (UIVs) to each user logged in at a port of a network access server (NAS);

maintaining a master list of UIVs associated with logged in users and their respective group identification information;

periodically checking a NAS to determine if it has become non-operational;

10 responding to the non-operational status of a NAS by removing all UIVs associated with the non-operational NAS from said master list and decrementing the count of the particular resource used by the number of UIVs removed from said master list.

15 24. A method in accordance with claim 23 wherein said periodically checking is performed by an Authentication, Authorization and Accounting Server (AAA) associated with the MSS.

25. A method in accordance with claim 23, further comprising:

20 transmitting a communication to another MSS on the data communications network to inform it of the non-operational status of a NAS.

26. A method in accordance with claim 25, further comprising:

receiving a communication from another MSS on the data communication network advising of the non-operational status of a NAS;

responding to said communication by removing all UIVs associated with
 5 the non-operational NAS from said master list and decrementing the count of the particular resource used by the number of UIVs removed from said master list.

27. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for a Max
 10 Sessions Server (MSS) of a data communications network keeping a count of the sessions used at a given time by a group of users to correct said count to compensate for abnormal disconnections of users belonging to said group, said method comprising:

assigning unique identifications values (UIVs) to each user logged in at a
 15 port of a network access server (NAS);

maintaining a master list of UIVs associated with logged in users and their respective group identification information;

periodically checking a NAS to determine if it has become non-operational;

responding to the non-operational status of a NAS by removing all UIVs
 20 associated with the non-operational NAS from said master list and decrementing the count of the sessions used by the number of UIVs removed from said master list.

28. A program storage device readable by a machine, tangibly embodying a program of instruction executable by the machine to perform a method for a Resource Control Server (RCS) of a data communications network keeping a count of a particular resource used at a given time by a group of users to correct
 5 said count to compensate for abnormal disconnections of users belong to said group, said method comprising:

assigning unique identifications values (UIVs) to each used logged in at a port of a network access server (NAS);

maintaining a master list of UIVs associated with logged in users and their
 10 respective group identification information;

periodically checking a NAS to determine if it has become non-operational;

responding to the non-operational status of a NAS by removing all UIVs associated with the non-operational NAS from said master list and decrementing the count of the particular resource used by the number of UIVs removed from
 15 said master list.

29. An abnormal user disconnection and compensation system for a Max Sessions Server (MSS) keeping a count of the sessions used at a given time by a group of users, said system comprising:

20 a MSS;

a database maintained by said MSS including for each user logged into the data communications system through the MSS, the user belonging to a group, a

unique identification value (UIV) associated with the user's connection to the data communications network through a particular port of a particular Network Assess Server (NAS) for the data communications network, and group identification information associated with the user;

- 5 a checker to compare each new log in request directed to the MSS with the contents of said database to determine if a UIV of the new log in request matches an existing UIV in the database; and

 a clearer to clear existing information in the database associated with said UIV if said checker determines that a UIV in the database is the same as the UIV
10 of a new log in request.

30. A system in accordance with claim 29, further comprising:
 a counter keeping a count of sessions used by a group of users.

- 15 31. A system in accordance with claim 30, further comprising:
 an incrementer incrementing said counter for each new log in by a member of said group of users.

- 20 32. A system in accordance with claim 31, further comprising:
 a decrementer decrementing said counter for each disconnection of a member of said group of users.

33. A system in accordance with claim 32, further comprising:
a log in rejector rejecting a user belonging to said group of user's attempt to
log in if said log in would cause said counter to exceed an authorized session
count for said group of users.

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34. A system in accordance with claim 33, further comprising:
a NAS checker checking a NAS associated with said MSS to determine if it
has become non-operational; and

a broken NAS clearer clearing existing information in the database
10 associated with a NAS if said NAS checker determines said NAS to be non-
operational.

35. A system in accordance with claim 34, further comprising:
a transmitter transmitting a communication to another MSS on the data
15 communications network to inform it of the non-operational status of a NAS.

36. A system in accordance with claim 33, further comprising:
a receiver receiving communications over the data communications
network informing of the non-operational status of a NAS.

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37. A system in accordance with claim 36, further comprising:

a broken NAS clearer clearing existing information in the database associated with a NAS if said receiver is informed of the non-operational status of said NAS.

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38. An abnormal user disconnection and compensation system for a Resource Control Sever (RCS) keeping a count of the particular resource used at a given time by a group of users, said system comprising:

a RCS;

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a database maintained by said RCS including for each user logged into the data communications system through the RCS, the user belonging to a group, a unique identification value (UIV) associated with the user's connection to the data communications network through a particular port of a particular Network Assess Server (NAS) for the data communications network, and group identification information associated with the user;

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a checker to compare each new log in request directed to the RCS with the contents of said database to determine if a UIV of the new log in request matches an existing UIV in the database; and

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a clearer to clear existing information in the database associated with said UIV if said checker determines that a UIV in the database is the same as the UIV of a new log in request.

39. A system in accordance with claim 38, further comprising:
a counter keeping a count of resources used by a group of users.
40. A system in accordance with claim 39, further comprising:
5 an incrementer incrementing said counter for each new use of resources in
by a member of said group of users.
41. A system in accordance with claim 40, further comprising;
a decrementer decrementing said counter for each disconnection of a
10 member of said group of users using resources.
42. A system in accordance with claim 41, further comprising:
a NAS checker checking a NAS associated with said RCS to determine if it
has become non-operational; and
15 a broken NAS clearer clearing existing information in the database
associated with a NAS if said NAS checker determines said NAS to be non-
operational.
43. A system in accordance with claim 42, further comprising:
20 a transmitter transmitting a communication to another RCS on the data
communications network to inform it of the non-operational status of a NAS.

44. A system in accordance with claim 41, further comprising:

a receiver receiving communications over the data communications network informing of the non-operational status of a NAS.

5 45. A system in accordance with claim 44, further comprising:

a broken NAS clearer clearing existing information in the database associated with a NAS if said receiver is informed of the non-operational status of said NAS.

10 46. A method for a Max Sessions Server (MSS) to detect hardware or communication failures at a NAS or at a particular port on an NAS, said method comprising:

maintaining a master list of unique identification numbers associated with each logged in user;

15 responding to a user's attempt to log into the data communications network by checking to see if the unique identification number associated with the is already on the master list;

removing the unique identification number from the master list if said unique identification number already appears on the list;

20 decrementing the corresponding MSS counter(s) by one if said unique identification number is already on the master list.

having an associated AAA (Authentication, Authorization, and Accounting) server automatically checking on a periodic time basis to determine if the said NAS has failed to communicate, said AAA notifying MSS if said the NAS does fail to communicate;

5 removing all said unique identification numbers associated with said NAS from the master list if said NAS fails to communicate within said time limit;

decrementing the MSS counters by the total number of lost connections on said NAS if said NAS fails to communicate within said time limit.

10 47. A method according to claim 46, further comprising:
broadcasting said NAS failure to all MSSs associated with said NAS.

48. A method according to claim 46, further comprising:
rejecting the user's attempt to log in if the user's log in would cause a count
15 of the sessions in use by the user or by a group to which the user belongs to exceed a predetermined number of maximum sessions allowed by the MSS for the user or the group to which the user belongs.

49. A method according to claim 46, further comprising:
20 allowing the user's attempt to log in if the user's log in would not cause a count of the sessions in use by the user or a group to which the user belongs to

exceed a predetermined maximum number of sessions allowed by the MSS for the user or the group to which the user belongs;

incrementing the corresponding counter(s) of number of logged in sessions by one;

5 adding the said unique identification number to the master list.

50. A method according to claim 46, wherein:

the unique identification numbers are formed by concatenation of a NAS identifier and a port identifier.